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November 03, 1998

ATTORNEY DOCKET NO. 01706.0037

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

New U.S. Patent Application

Title: SWITCHING VSAT TRANSMITTER

Inventors: Tal MEIRZON and Ido NORDENBERG

Sir:

We enclose the following papers for filing in the United States Patent and Trademark Office in connection with the above patent application.

1. Application - 13 pages, including 3 independent claims and 16 claims total.

2. Drawings - 4 sheets of formal drawings containing 4 figures.

3. Declaration and Power of Attorney.

4. Recordation Form Cover Sheet and Assignment to GILAT SATELLITE NETWORKS LTD..

5. Check in the amount of $830.00 representing a $790.00 filing fee and a $40.00 assignment recording fee.

The Commissioner is hereby authorized to charge any additional filing fees due and any other fees due under 37 C.F.R. § 1.16 or § 1.17 during the pendency of this application to our Deposit Account No. 06-0916.

Please accord this application a serial number and filing date and record and return the Assignment to the undersigned.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

By ______________________
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01706.0037/mld
Enclosures

FIELD OF THE INVENTION

The present invention relates to telecommunication in general, and in particular to improved VSAT satellite telecommunications methods and apparatus.

BACKGROUND OF THE INVENTION

Primary design considerations for a VSAT satellite telecommunication network include the cost of the remote terminal (VSAT) as a function of its complexity, power consumption, and dish size, the bandwidth efficiency as determined by the access scheme, and the cost of the network switch or "hub." The type and availability of a power source may have a significant impact on the cost of a VSAT, particularly in rural or remote regions where power supply is relatively scarce and expensive.

SUMMARY OF THE INVENTION

The present invention seeks to provide improved VSAT satellite telecommunications methods and apparatus having reduced overall power consumption. A typical low cost VSAT terminal comprises simple power and low noise amplifiers. These amplifiers are the major power consuming elements, and often account for more than 50% of total VSAT power consumption. Power switching methods and apparatus is provided for use with such simple, low cost amplifiers that are not generally equipped with controllers.

There is thus provided in accordance with a preferred embodiment of the present invention a VSAT terminal including an antenna, a microwave power amplifier, a microwave low noise amplifier, a transmitter coupled via the microwave power amplifier to the antenna, a receiver coupled via the microwave low noise amplifier to the antenna, a user VSAT interface, and a controller in communication with the user VSAT interface and in electrical connection with the

microwave power amplifier and the microwave low noise amplifier for supplying power thereto, the controller being operative to provide a less-than-full electrical power supply to either of the amplifiers in the absence of a communication session and operative to provide a full electrical power supply to either of the amplifiers in the presence of a communication session.

Further in accordance with a preferred embodiment of the present invention the controller is responsive to operation of the user VSAT interface for providing electrical power to the microwave power amplifier.

Still further in accordance with a preferred embodiment of the present invention the controller is responsive to operation of the user VSAT interface for providing electrical power to the microwave low noise amplifier.

Additionally in accordance with a preferred embodiment of the present invention the controller provides a less-than-full power supply to the microwave low noise amplifier and the microwave power amplifier in the absence of a communication session and the controller is responsive to operation of the user VSAT interface for providing a full electrical power supply to the microwave low noise amplifier and the microwave power amplifier.

Moreover in accordance with a preferred embodiment of the present invention the controller provides a less-than-full power supply to the microwave power amplifier and a full power supply to the microwave low noise amplifier in the absence of a communication session and the controller is responsive to operation of the user VSAT interface for providing a full electrical power supply to the microwave low noise amplifier and the microwave power amplifier.

Further in accordance with a preferred embodiment of the present invention the controller provides a less-than-full power supply to the microwave power amplifier and a full power supply to the microwave low noise amplifier in the absence of a communication session and the controller is responsive to receipt of an incoming transmission via the microwave low noise amplifier for providing a full electrical power supply to the microwave low noise amplifier and the microwave power amplifier.

Still further in accordance with a preferred embodiment of the present invention the controller is operative to provide a less-than-full electrical power supply to either of the amplifiers after a predetermined period of inactivity of the user VSAT interface.

Additionally in accordance with a preferred embodiment of the present invention the controller is operative to provide a less-than-full electrical power supply to either of the amplifiers after a predetermined period of inactivity of the microwave low noise amplifier.

Moreover in accordance with a preferred embodiment of the present invention the controller operates in accordance with a predetermined algorithm for providing electrical power to the microwave power amplifier.

There is also provided in accordance with a preferred embodiment of the present invention a VSAT telecommunication network including at lease one satellite, and a plurality of VSAT terminals in communication with the satellite, the at least one of the VSAT terminals includes an antenna, a microwave power amplifier, a microwave low noise amplifier, a transmitter coupled via the microwave power amplifier to the antenna, a receiver coupled via the microwave low noise amplifier to the antenna, a user VSAT interface, and a controller in communication with the user VSAT interface and in electrical connection with the microwave power amplifier and the microwave low noise amplifier for supplying power thereto, the controller being operative to provide a less-than-full electrical power supply to either of the amplifiers in the absence of a communication session and operative to provide a full electrical power supply to either of the amplifiers in the presence of a communication session.

There is additionally provided in accordance with a preferred embodiment of the present invention a method for managing power consumption in a VSAT terminal having an antenna, a microwave power amplifier, a microwave low noise amplifier, a transmitter coupled via the microwave power amplifier to the antenna, a receiver coupled via the microwave low noise amplifier to the antenna, a user VSAT interface, and a controller in communication with the user VSAT interface, the microwave low noise amplifier, and the microwave power amplifier, the

method including providing a less-than-full electrical power supply to either of the amplifiers in the absence of a communication session, and providing a full electrical power supply to either of the amplifiers in the presence of a communication session.

Further in accordance with a preferred embodiment of the present invention the providing a less-than-full electrical power supply step includes providing a less-than-full power supply to the microwave low noise amplifier and the microwave power amplifier in the absence of a communication session and the providing a full electrical power supply step includes providing a full electrical power supply to the microwave low noise amplifier and the microwave power amplifier in response to operation of the user VSAT interface.

Still further in accordance with a preferred embodiment of the present invention the method further includes providing a full power supply to the microwave power amplifier in the absence of a communication session, the providing a less-than-full electrical power supply step includes providing a less-than-full power supply to the microwave power amplifier and the providing a full electrical power supply step includes providing a full electrical power supply to the microwave power amplifier and the microwave power amplifier in response to operation of the user VSAT interface.

Additionally in accordance with a preferred embodiment of the present invention the method further includes providing a full power supply to the microwave power amplifier in the absence of a communication session, the providing a less-than-full electrical power supply step includes providing a less-than-full power supply to the microwave power amplifier and the providing a full electrical power supply step includes providing a full electrical power supply to the microwave low noise amplifier and the microwave power amplifier in response to receipt of an incoming transmission via the microwave low noise amplifier.

Moreover in accordance with a preferred embodiment of the present invention the providing a less-than-full electrical power supply step includes providing a less-than-full power supply to either of the amplifiers after a predetermined period of inactivity of the user VSAT

interface.

Further in accordance with a preferred embodiment of the present invention the providing a less-than-full electrical power supply step includes providing a less-than-full power supply to either of the amplifiers after a predetermined period of inactivity of the microwave low noise amplifier.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified pictorial illustration of a VSAT satellite telecommunication network system constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 2 is a simplified block diagram of the VSAT terminal of Fig. 1;

Fig. 3 is a simplified flow chart of a method of using VSAT 10 operative in accordance with a preferred embodiment of the present invention; and

Fig. 4 is a simplified block diagram of electronic elements of controller 14 of Fig. 2.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1 which is a simplified pictorial illustration of a VSAT satellite telecommunication network system constructed and operative in accordance with a preferred embodiment of the present invention. In the system of Fig. 1 one or more VSATs 10, typically including an antenna 12 connected to a control unit 14, also referred to as an "indoor unit" or IDU, are provided, for communication with a satellite 20. VSAT 10 is typically connected to one or more user interfaces such as a computer 16 and a voice communicator 18. A power source 22 is provided to power VSAT 10. In rural or remote areas, such as the mountainous region shown in Fig. 1, any power source 22 may be an alternative power source such as a windmill or solar

panels, although any known power source may be provided.

Reference is now made to Fig. 2 which is a simplified block diagram of the VSAT terminal 10 of Fig. 1. Terminal 10 typically comprises a power amplifier 24 connected to antenna 12, such as any known microwave power amplifier, a transmitter 26, and a user VSAT interface 28, typically connectable to computer 16 and voice communicator 18. Terminal 10 also typically comprises a low noise amplifier 30 connected to antenna 12, such as any known microwave low noise amplifier, and a receiver 32. A controller 15, typically being connected to power source 22 via a power supply 23, directs full power or less-than-full power to power amplifier 24 and/or low noise amplifier 30 as described hereinbelow. Transmitter 26, user VSAT interface 28, receiver 32, controller 15, and power supply 23 typically collectively form control unit 14.

Typical operation of VSAT 10 of Fig. 2 is now described with additional reference to Fig. 3 which is a simplified flow chart of a method of using VSAT 10 operative in accordance with a preferred embodiment of the present invention. The method of Fig. 3 provides for two preferred modes of operation of VSAT 10. In one mode of operation a communication session may be initiated by either a user via user VSAT interface 28 or by another VSAT or hub wishing to communicate with VSAT 10. In this mode controller 14 provides full power to low noise amplifier 30 and less-than-full power to power amplifier 24. Less-than-full power may be any power level less than that which is required for normal operation of low noise amplifier 30 and power amplifier 24, including no power at all. Controller 14 then waits until an incoming transmission is received by VSAT 10 or until a user initiates an outgoing transmission. Controller 14 then continues to provide full power low noise amplifier 30, as well as to power amplifier 24.

In another mode of operation a communication session may only be initiated by a user via user VSAT interface 28. In this mode controller 14 provides less-than-full power to low noise amplifier 30 and power amplifier 24. Controller 14 then waits until the user initiates an outgoing transmission. Controller 14 then provides full power to both low noise amplifier 30 and power amplifier 24.

Whichever operational mode is used, once a session has either been expressly ended or a predetermined period of inactivity has elapsed, low noise amplifier 30 and power amplifier 24 preferably revert to their pre-session power modes as indicated above.

It is appreciated that the method of Fig. 3 may be partly or wholly implemented as a computer software algorithm, as preprogrammed computer hardware, or as any suitable combination using techniques well known in the art.

Reference is now made to Fig. 4 which is a simplified block diagram of transmission and power control elements typically included in controller 14 of Fig. 2. In addition to transmission circuitry well known for VSAT control units, a power control switch 34 is provided, typically coupled to a power source 36 which may be an AC or DC power source. In this manner power may be provided together with an RF transmission via an output 38 to the antenna transmitter and power amplifier (not shown), or cut off when there is no RF transmission to be sent.

It is appreciated that various features of the invention which are, for clarity, described in the contexts of separate embodiments may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment may also be provided separately or in any suitable subcombination.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention is defined only by the claims that follow:

CLAIMS

What is claimed is:

1. A VSAT terminal comprising:

an antenna;

a microwave power amplifier;

a microwave low noise amplifier;

a transmitter coupled via said microwave power amplifier to said antenna;

a receiver coupled via said microwave low noise amplifier to said antenna;

a user VSAT interface; and

a controller in communication with said user VSAT interface and in electrical connection with said microwave power amplifier and said microwave low noise amplifier for supplying power thereto, said controller being operative to provide a less-than-full electrical power supply to either of said amplifiers in the absence of a communication session and operative to provide a full electrical power supply to either of said amplifiers in the presence of a communication session.

2. A VSAT terminal according to claim 1 wherein said controller is responsive to operation of said user VSAT interface for providing electrical power to said microwave power amplifier.

3. A VSAT terminal according to claim 1 wherein said controller is responsive to operation of said user VSAT interface for providing electrical power to said microwave low noise amplifier.

4. A VSAT terminal according to claim 1 wherein said controller provides a less-than-full power supply to said microwave low noise amplifier and said microwave power amplifier in the

absence of a communication session and wherein said controller is responsive to operation of said user VSAT interface for providing a full electrical power supply to said microwave low noise amplifier and said microwave power amplifier.

5. A VSAT terminal according to claim 1 wherein said controller provides a less-than-full power supply to said microwave power amplifier and a full power supply to said microwave low noise amplifier in the absence of a communication session and wherein said controller is responsive to operation of said user VSAT interface for providing a full electrical power supply to said microwave low noise amplifier and said microwave power amplifier.

6. A VSAT terminal according to claim 1 wherein said controller provides a less-than-full power supply to said microwave power amplifier and a full power supply to said microwave low noise amplifier in the absence of a communication session and wherein said controller is responsive to receipt of an incoming transmission via said microwave low noise amplifier for providing a full electrical power supply to said microwave low noise amplifier and said microwave power amplifier.

7. A VSAT terminal according to claim 1 and wherein said controller is operative to provide a less-than-full electrical power supply to either of said amplifiers after a predetermined period of inactivity of said user VSAT interface.

8. A VSAT terminal according to claim 1 and wherein said controller is operative to provide a less-than-full electrical power supply to either of said amplifiers after a predetermined period of inactivity of said microwave low noise amplifier.

9. A VSAT terminal according to claim 1 and wherein said controller operates in accordance with a predetermined algorithm for providing electrical power to said microwave power amplifier.

10. A VSAT telecommunication network comprising:

at lease one satellite; and

a plurality of VSAT terminals in communication with said satellite, wherein at least one of said VSAT terminals comprises:

an antenna;

a microwave power amplifier;

a microwave low noise amplifier;

a transmitter coupled via said microwave power amplifier to said antenna;

a receiver coupled via said microwave low noise amplifier to said antenna;

a user VSAT interface; and

a controller in communication with said user VSAT interface and in electrical connection with said microwave power amplifier and said microwave low noise amplifier for supplying power thereto, said controller being operative to provide a less-than-full electrical power supply to either of said amplifiers in the absence of a communication session and operative to provide a full electrical power supply to either of said amplifiers in the presence of a communication session.

11. A method for managing power consumption in a VSAT terminal having an antenna, a microwave power amplifier, a microwave low noise amplifier, a transmitter coupled via said microwave power amplifier to said antenna, a receiver coupled via said microwave low noise amplifier to said antenna, a user VSAT interface, and a controller in communication with said user VSAT interface, said microwave low noise amplifier, and said microwave power amplifier, the

method comprising:

providing a less-than-full electrical power supply to either of said amplifiers in the absence of a communication session; and

providing a full electrical power supply to either of said amplifiers in the presence of a communication session.

12. A method according to claim 11 wherein said providing a less-than-full electrical power supply step comprises providing a less-than-full power supply to said microwave low noise amplifier and said microwave power amplifier in the absence of a communication session and wherein said providing a full electrical power supply step comprises providing a full electrical power supply to said microwave low noise amplifier and said microwave power amplifier in response to operation of said user VSAT interface.

13. A method according to claim 11 and further comprising providing a full power supply to said microwave power amplifier in the absence of a communication session, wherein said providing a less-than-full electrical power supply step comprises providing a less-than-full power supply to said microwave power amplifier and wherein said providing a full electrical power supply step comprises providing a full electrical power supply to said microwave power amplifier and said microwave power amplifier in response to operation of said user VSAT interface.

14. A method according to claim 11 and further comprising providing a full power supply to said microwave power amplifier in the absence of a communication session, wherein said providing a less-than-full electrical power supply step comprises providing a less-than-full power supply to said microwave power amplifier and wherein said providing a full electrical power supply step comprises providing a full electrical power supply to said microwave low noise amplifier and said microwave power amplifier in response to receipt of an incoming transmission via said

microwave low noise amplifier.

15. A method according to claim 11 and wherein said providing a less-than-full electrical power supply step comprises providing a less-than-full power supply to either of said amplifiers after a predetermined period of inactivity of said user VSAT interface.

16. A method according to claim 11 and wherein said providing a less-than-full electrical power supply step comprises providing a less-than-full power supply to either of said amplifiers after a predetermined period of inactivity of said microwave low noise amplifier.

ABSTRACT OF THE DISCLOSURE

A VSAT terminal including an antenna, a microwave power amplifier, a microwave low noise amplifier, a transmitter coupled via the microwave power amplifier to the antenna, a receiver coupled via the microwave low noise amplifier to the antenna, a user VSAT interface, and a controller in communication with the user VSAT interface and in electrical connection with the microwave power amplifier and the microwave low noise amplifier for supplying power thereto, the controller being operative to provide a less-than-full electrical power supply to either of the amplifiers in the absence of a communication session and operative to provide a full electrical power supply to either of the amplifiers in the presence of a communication session.

FIG. 1

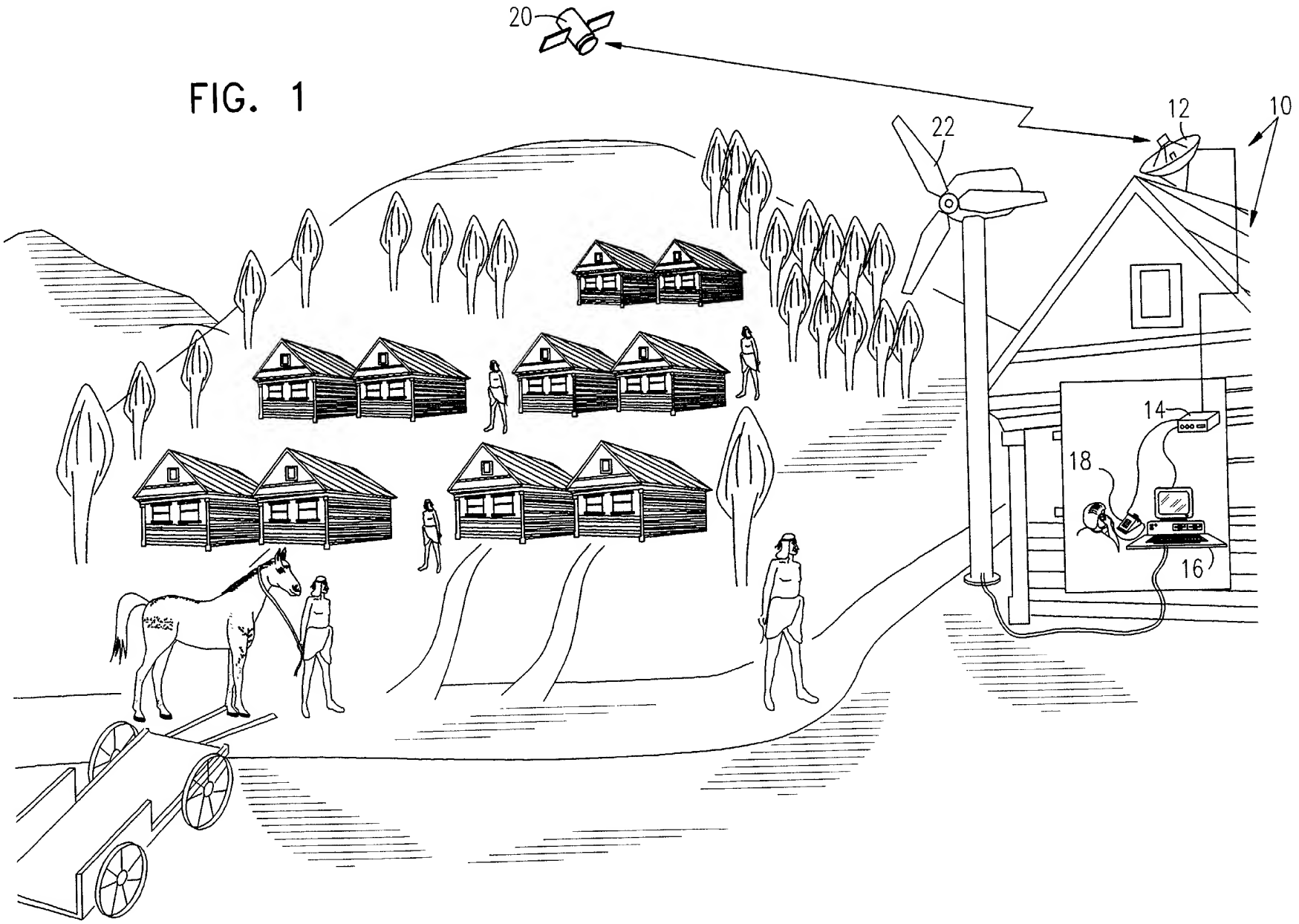
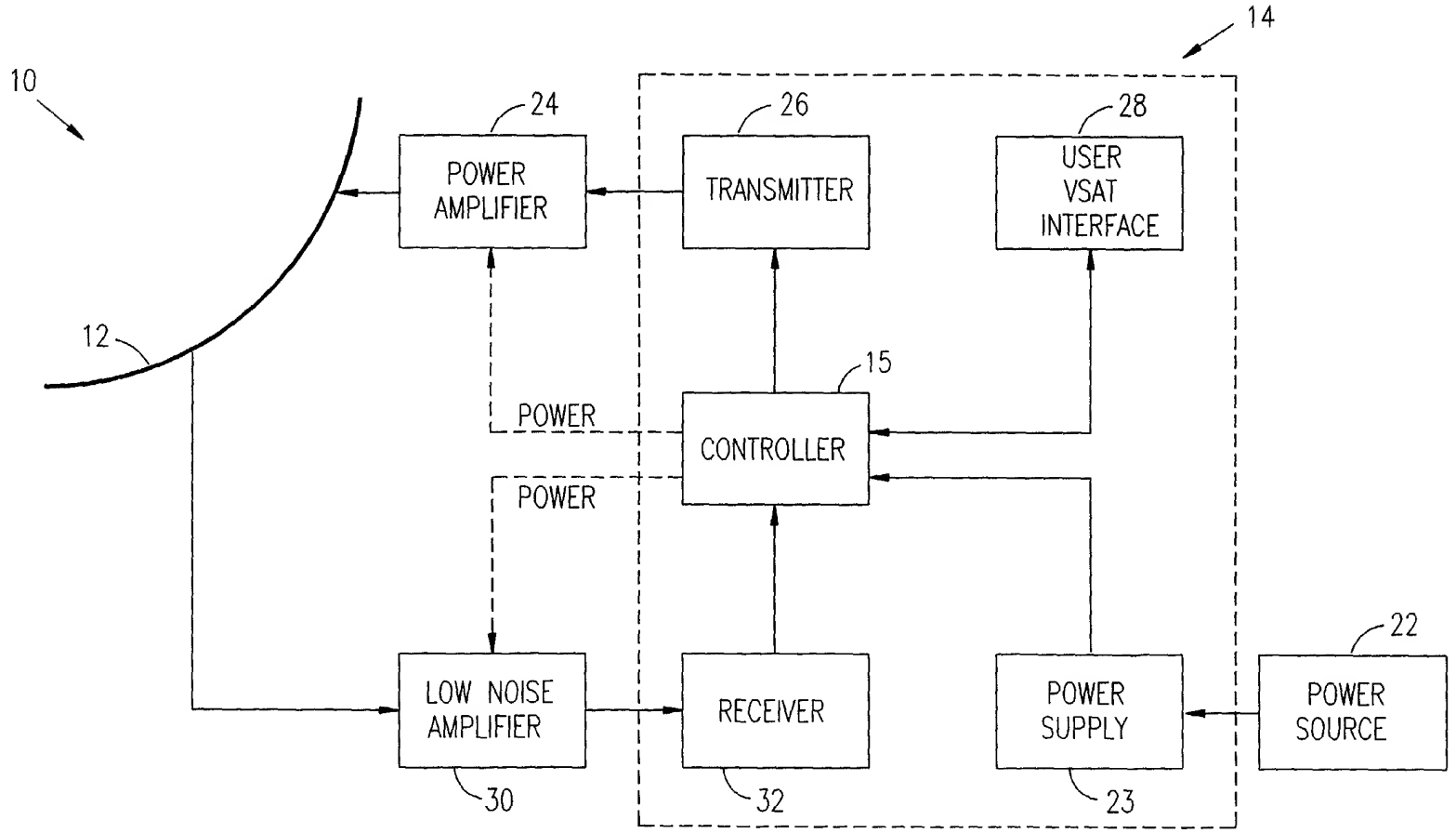


FIG. 2


14
10
24
26
28
POWER AMPLIFIER
TRANSMITTER
USER VSAT INTERFACE
12
15
POWER
CONTROLLER
POWER
22
LOW NOISE AMPLIFIER
RECEIVER
POWER SUPPLY
POWER SOURCE
30
32
23

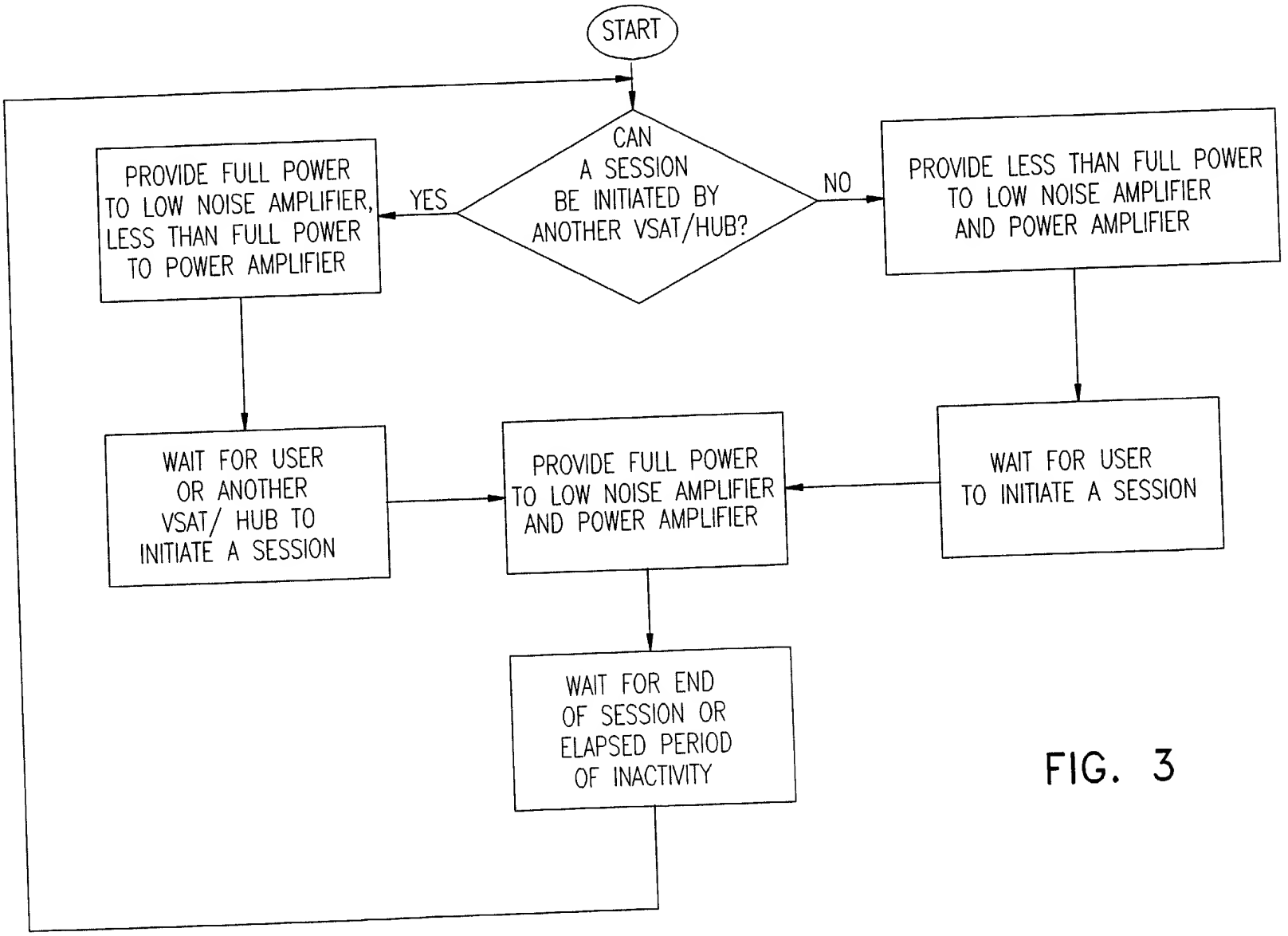
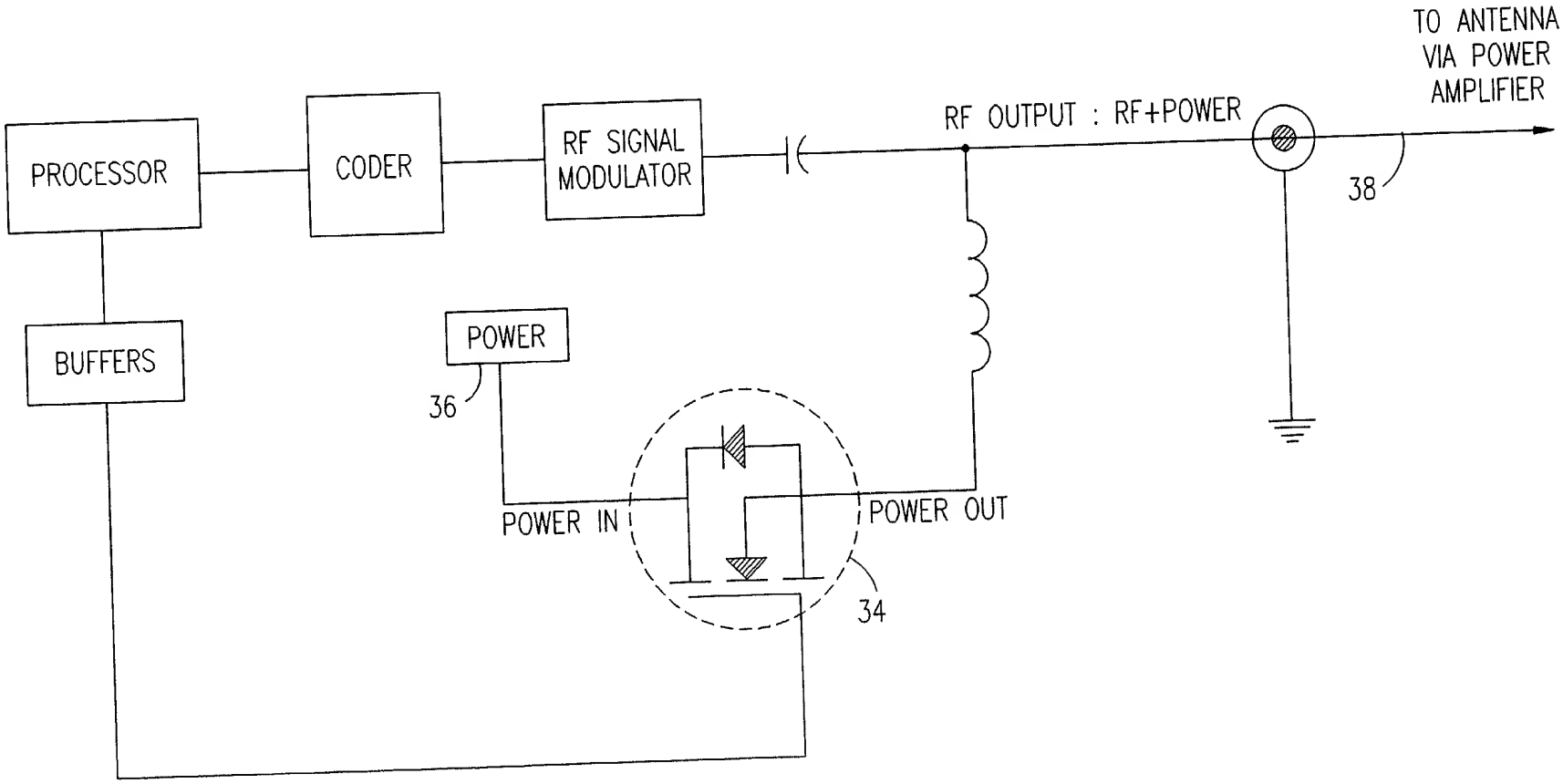

START
CAN A SESSION BE INITIATED BY ANOTHER VSAT/HUB?
YES
NO
PROVIDE FULL POWER TO LOW NOISE AMPLIFIER, LESS THAN FULL POWER TO POWER AMPLIFIER
PROVIDE LESS THAN FULL POWER TO LOW NOISE AMPLIFIER AND POWER AMPLIFIER
WAIT FOR USER OR ANOTHER VSAT/ HUB TO INITIATE A SESSION
PROVIDE FULL POWER TO LOW NOISE AMPLIFIER AND POWER AMPLIFIER
WAIT FOR USER TO INITIATE A SESSION
WAIT FOR END OF SESSION OR ELAPSED PERIOD OF INACTIVITY

FIG. 3

FIG. 4


PROCESSOR
CODER
RF SIGNAL MODULATOR
RF OUTPUT : RF+POWER
TO ANTENNA VIA POWER AMPLIFIER
38
BUFFERS
POWER
36
POWER IN
POWER OUT
34

DECLARATION AND POWER OF ATTORNEY

Atty. Docket No.

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SWITCHING VSAT TRANSMITTER

the specification of which is attached hereto; or

was filed as United States application Serial No.
on and was amended
on _____ (if applicable); or

was filed as PCT international application Number
on and was amended
on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate or § 365(a) of any PCT international application(s) designating at least one country other than the United States, listed below and have also identified below, any foreign application(s) for patent or inventor's certificate, or any PCT international application(s) having a filing date before that of the application(s) of which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C.119
			Yes No
			Yes No
			Yes No
			Yes No
			Yes No
			Yes No

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	DATE OF FILING

DECLARATION AND POWER OF ATTORNEY (Continued)

Atty. Docket No.

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) or § 365(c) of any PCT international application(s), designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application(s) in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. § 1.56 which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

APPLICATIONS		STATUS (Check one)		
APPLICATION NUMBER	DATE OF FILING	PATENTED	PENDING	ABANDONED

I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. **FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P. Reg. No. 22,540;** Douglas B. Henderson, Reg. No. 20,291; Ford F. Farabow, Jr., Reg. No. 20,630; Arthur S. Garrett, Reg. No. 20,338; Donald R. Dunner, Reg. No. 19,073; Brian G. Brunsvold, Reg. No. 22,593; Tipton D. Jennings, IV, Reg. No. 20,645; Jerry D. Voight, Reg. No. 23,020; Laurence R. Hefter, Reg. No. 20,827; Kenneth E. Payne, Reg. No. 23,098; Herbert H. Mintz, Reg. No. 26,691; C. Larry O'Rourke, Reg. No. 26,014 Albert J. Santorelli, Reg. No. 22,610; Michael C. Elmer, Reg. No. 25,857; Richard H. Smith, Reg. No. 20,609; Stephen L. Peterson, Reg. No. 26,325; John M. Romary, Reg. No. 26,331; Bruce C. Zotter, Reg. No. 27,680; Dennis P. O'Reilley, Reg. No. 27,932; Allen M. Sokal, Reg. No. 26,695; Robert D. Bajefsky, Reg. No. 25,387; Richard L. Stroup, Reg. No. 28,478; David W. Hill, Reg. No. 28,220; Thomas L. Irving, Reg. No. 28,619; Charles E. Lipsey, Reg. No. 28,165; Thomas W. Winland, Reg. No. 27,605; Basil J. Lewris, Reg. No. 28,818; Martin I. Fuchs, Reg. No. 28,508; E. Robert Yoches, Reg. No. 30,120; Barry W. Graham, Reg. No. 29,924; Susan Haberman Griffen, Reg. No. 30,907; Richard B. Racine, Reg. No. 30,415; Thomas H. Jenkins, Reg. No. 30,857; Robert E. Converse, Jr., Reg. No. 27,432; Clair X. Mullen, Jr., Reg. No. 20,348; Christopher P. Foley, Reg. No. 31,354; John C. Paul, Reg. No. 30,413; David M. Kelly, Reg. No. 30,953; Kenneth J. Meyers, Reg. No. 25,146; Carol P. Einaudi, Reg. No. 32,220; Walter Y. Boyd, Jr., Reg. No. 31,738; Steven M. Anzalone, Reg. No. 32,095; Jean B. Fordis, Reg. No. 32,984; Barbara C. McCurdy, Reg. No. 32,120; James K. Hammond, Reg. No. 31,964; Richard V. Burgujian, Reg. No. 31,744; J. Michael Jakes, Reg. No. 32,824; Thomas W. Banks, Reg. No. 32,719; M. Paul Barker, Reg. No. 32,013; Bryan C. Diner, Reg. No. 32,409; Christopher P. Isaac, Reg. No. 32,616; Andrew Chanho Sonu, Reg. No.33,457; Dirk D. Thomas, Reg. No. 32,600; David S. Forman, Reg. No. 33,694; Vincent P. Kovalick, Reg. No. 32,867; James W. Edmondson, Reg. No. 33,871; Michael R. McGurk, Reg. No. 32,045; Joann M. Neth, Reg. No. 36,363; Gerson S. Panitch, Reg. No. 33,751; Cheri M. Taylor, Reg. No. 33,216; Charles E. Van Horn, Reg. No. 40,266; and _____.

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DECLARATION AND POWER OF ATTORNEY (Continued)

Atty. Docket No.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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POST OFFICE ADDRESS		
THIRD INVENTOR'S SIGNATURE		DATE

Listing of Inventors Continued on attached page(s) /__/Yes /X/No